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PROVINCE OF BRITISH COLUMBIA

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DEPARTMENT OF EDUCATION

TREES AND SHRUBS

THEIR SELECTION, PLANTING AND CARE

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CIRCULAR NO. 6

THE GOVERNMENT OF THE PROVINCE OF BRITISH COLUMBIA

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TREES AND SHRUBS

THEIR SELECTION, PLANTING, AND CARE.

On the Value of Trees.

OF all the factors in the natural world around us that contribute to our comfort and enjoyment out-of-doors none are quite so important as our trees. They are at once useful and beautiful. We seek their protection as if by instinct when exposed to sun, or wind, or rain. We delight in their companionship and appreciate their moods. Whether in youth we climb in their branches or romp about in their pleasant shade, or in later years we sit in quiet reverie beneath their glorious canopy, we cannot but say with Professor Waugh: "Let God be praised for trees."

In Canada, unfortunately, we have not yet learned the lesson that older countries have learned and have put into practice; that is, the importance of conserving the remaining forests and of producing new plantations. For a long time, and in parts of Canada even yet, the pioneer citizen has regarded the trees as his natural enemies—something to be destroyed or to be disposed of as quickly as possible. Through the organized efforts, however, of our Dominion and Provincial Departments of Forestry, people generally are slowly coming to realize the tremendous importance of our natural forest resources, and of increasing rather than as heretofore diminishing our supply of merchantable timber. There are large areas in British Columbia as well as in other Provinces, that can never be more profitably utilized than in the growing of trees. Speaking of the vast importance of our forests as the source of the wood-supply of the world, Professor Fernow says: "Outside of food products no material is so universally used and indispensable in human economy as wood. Our civilization is built on wood. From the cradle to the coffin in some shape or other it surrounds us as a convenience or a necessity." From the standpoint, therefore, of mere utility and future necessity it is important that the boys and girls of our schools, as well as owners of land, civic and other corporations, should give more attention to this matter of tree-planting.

But there are other reasons why we should all learn the art and form the habit of planting trees. Trees add much to the beauty of any landscape. They are beautiful both individually and collectively. One writer says: "Next to the human form the most beautiful unit in nature is a tree." Imagine pleasure-grounds and parks without trees! How disappointing is a lake or river destitute of trees! Look at a street or roadway with nothing but earth and gravel and concrete, bordered perhaps by rows of telephone and trolly poles, and then look at one with its trimmed boulevards

and its graceful lines of trees, and say which you would prefer to live on. Contrast the glaring bareness and untidiness of the former with the comfort, beauty, and healthfulness of the latter, and you will realize the great value of trees and the utility of beauty as a factor in human life.

And that is not all. Trees are most interesting in themselves. They are prime favourites with all nature students. They afford almost unlimited opportunity for students of art and of science. They afford new interest with each succeeding season, and seem to respond to every climatic change. This makes them more companionable and may account in part for the high esteem in which trees have always been held by all peoples since the world began.

"The groves were God's first temples. . . . In the darkling wood amid the cool and silence, he knelt down, and offered to the Mightiest solemn thanks and supplication."—*Bryant.*

Kinds of Trees and their Arrangement.

There are trees suitable for every purpose, but how often people choose the wrong kind for the purpose in view. This is particularly true when people are selecting trees for decorative effect, either on streets or for home and school planting. A tree might be very beautiful in itself, but entirely out of harmony with its surroundings. The strongly accentuated vertical lines of the Lombardy poplar, for example, would not harmonize with the strong horizontal lines of a plain or prairie. They would appear as "exclamation" points. They would at once seem unrelated and discordant. Adaptation to site and surroundings must never be lost sight of in the planting of trees and shrubbery. Then there are frequently specific results to be obtained by planting, as, for example, the shutting-out of objectionable views or providing a shelter from prevailing winds. Or it may be that extremes of drought or temperature demand consideration. The texture and composition of the soil may limit the number of varieties that can be grown. In short, all conditions that might affect the normal development of the trees planted should first be considered.

There is much to be said in favour of using such varieties as are native to the district. As a rule, each district has its own characteristic trees and shrubs. Their familiarity, too, often leads us to treat them with contempt when we come to choose trees for ornamental planting. In British Columbia the coniferous species predominate and should be used very frequently where evergreens can be used. When planted close together they are excellent for screens and wind-breaks, or as a background for other planting. In parks and large grounds they can be used for mass effects, but are unsuitable for street planting.

(1.) Planting in School-grounds.

Two main objects should always be kept in mind in the planting of trees and shrubs in school-grounds, viz.: (1) Improvement from an educational standpoint, and (2) improvement from the standpoint of artistic and esthetic quality. It may be difficult in some grounds to harmonize these two objects. From the standpoint of educational advantage a fairly large number of species should be represented, and especially those species native

to the Province and to the Dominion. Then, again, the material used will be of peculiar advantage to students in botany if a somewhat large number of plant families is included. For this purpose trees and shrubs should be supplemented by using herbaceous plants.

Trees.—The choice and location of trees within the school-grounds should first be determined. Afterwards, the selection and arrangement of ornamental shrubs and flowers may be proceeded with. In all cases due consideration must be given to the use to which each part of the school-ground is to be put. Outdoor games and recreation for the pupils must always have first consideration. In small grounds the only planting that can be done is around the boundaries, along walks, and in unused corners. In large grounds internal planting can be instituted with success. This will consist of lines of trees and groups of shrubbery dividing the grounds into well-defined areas for various purposes; as, for example, boys' grounds from girls' grounds; gardens from playgrounds, lawns, or tennis-courts. Areas reserved for games for the "infant" classes as separate from the general playground, driveways, wood-piling, and service areas, etc., can be defined. Planting of this character will take the place of board fences, which should never be used inside the school-grounds.

The planting of evergreens obtained locally, if possible, is frequently desirable across the rear line of the grounds and along one or both side-lines, according to the exposure or the beauty of the landscape. A good view should never be shut out by heavy planting. As the school building usually faces on a main street or roadway, it is desirable to use more open planting along the front of the grounds. Deciduous trees placed from 30 to 40 feet apart are best for the front. Where the grounds are large enough to permit of it, a row of deciduous trees may be planted about 30 feet apart, 20 or 25 feet inside the boundary-line of everygreens. Boundary trees are usually planted from 3 to 6 feet inside the line. Evergreens for screens or wind-breaks should not be more than 10 feet apart and about 5 feet inside the fence. Single "specimen" trees should be included in parts of the grounds not needed for play or garden purposes. The larger the number of such trees include[illegible]e better so long as the size of the grounds will permit of it, and they are not crowded together too much. In parks and large grounds generally trees in informal groups are always more natural and therefore more artistic than if placed in straight lines. Boundary and street lines alone should be straight. Tall-growing trees should not be planted close to a school building, and especially in front of the building. Trees of smaller growth may sometimes be grouped effectively towards the rear of the building. In any case, 30 to 40 feet should be kept clear of trees all around the main building.

Shrubs.—Next after the selection and locating of the trees in the grounds will come the planting of shrubs. From the mere fact that most people are more familiar with trees than with shrubs, this question of the selection and arrangement of shrubs offers some difficulty. It is well, first of all, to decide upon the location, after which careful consideration must be given to the question of varieties. Speaking generally, shrubs are best used in massed groups rather than singly. Choose a few varieties suitable to the

location and the conditions of climate and exposure and use plenty of them. An abundant supply of a few suitable varieties is better than a few specimens of numerous varieties. Repetition in shrubs, as in trees, gives character and unity at the same time. The grouping and arrangement of shrubs is a large and very vital question in connection with the ornamental planting of school or home grounds and cannot be fully treated here, but a few suggestions now may help in avoiding some very common mistakes in planting.

Shrubbery and flowers should always stand in relationship to some other feature in the grounds, such as walks, fences, corners, buildings, crossings, entrances, etc. Follow the system of grouping in irregular clumps or masses rather than individual planting. Never place a single shrub, no matter how great its individual beauty may be, by itself out in the lawn. Do not place even a group in the centre of the lawn, and this also holds for flower-beds. Some of the uses of shrubs and their arrangement are well set forth by Professor Frank Waugh, as follows:—

"A judicious arrangement of shrubbery will often obliterate more of the unpleasant, unnatural, and inartistic features of the grounds than any amount of other material or other work. Shrubs may be used in comparative profusion, because they take up but little room. A good view of some things can be obtained over the tops of low shrubs, and they can thus be given positions quite forbidden to trees.

"The union of the buildings with the grounds, so that the former seem parts of the latter, is also oftenest effected by the use of shrubs. A building with its smooth surfaces and rectangular lines arising abruptly out of the lawn gives a distinct note of disharmony. The remedy is to break up and, as far as possible, to obliterate the line of demarcation. Shrubs irregularly grouped along the walls and massed in retreating angles help to do this. Their most efficient assistants are the climbers, which may cling to the walls or twine about the porches, becoming almost part and parcel of the building. Shrubs and climbers together, judiciously placed, will often bring into the closest harmony a house and grounds which without them would have been at never-ending war with one another."

There are times, of course, where it is necessary to adhere to straight-line planting of trees and shrubs, as, for example, along straight walks, streets, or courtyards planted after the so-called architectural style, so as to harmonize with the commanding lines and form of the building. It is, of course, desirable to have lines of trees perfectly parallel with the lines in the grounds to which they are related. Hedges are usually constructed on this principle. Trimmed hedges are not very desirable in most school-grounds. They are too likely to be neglected at some time and, therefore, to lose their ornamental appearance. It is possible, however, to use low-growing shrubs in hedgerows that do not require pruning. Japanese barberry is one of the best for this purpose.

(2.) Planting on Streets.

Cities are unnatural and artificial at best. People are feeling this more and more of late. Individual citizens frequently do a great deal to

surround themselves with something of natural beauty. Some city men spend time and money lavishly in beautifying their own property, or in trying to do so, for all are not equally successful. The beautifying of home-grounds is too large a subject to be discussed here. Many books have been written on it, and it has become a favourite topic with magazine writers as well.

What trees and shrubs a man plants in his own grounds is usually decided by personal taste and convenience or by imitation. Unfortunately, most people give much more attention to the house itself and its inside furnishings than to the grounds and setting outside. So long as a man keeps within his own property-line he cannot very well be restrained from planting what he likes and where he pleases, but when he undertakes to do planting on public property he should have guidance from some authorized person or body having in mind a planting scheme for the district.

Where street planting has been done by private indivduals without any kind of organization or direction, one is likely to find trees of many different varieties, differing in shape and size as well as in quality or texture. Moreover, they may not be planted in the best place, are likely to be too close together and in poor alignment. A street is essentially formal and geometrical. It is the constant repetition of one idea. Uniformity is its most striking feature. It is, therefore, essential that trees or shrubs planted on streets should conform to this main feature. Such trees as are planted should, first of all, be of the same species. Then they should be as nearly as possible of the same type or form and of the same size.

Street trees are usually planted between the sidewalk and the curb, where the street is 50 feet wide and upwards. When the sidewalk is built adjoining the curb, the planting then, of course, must be done between the sidewalk and the street-line. The distance between trees in the row will vary somewhat with the width of the street and the variety of tree used. Usually, on wide streets the trees can be placed a little farther apart than in narrower streets. The limits of distance might be placed at 30 40 feet. The same species or variety of tree should be used on both sides of the street, unless in very exceptional cases. Unfortunately, our business streets as a rule have no provision for tree-planting, although some of the world's greatest cities have trees on their best business streets. On narrow streets a single row of trees may be planted, preferably on the north side of streets running east and west, and on the east side of streets running north and south.

The difficulties encountered in connection with street planting are in some respects similar to those met with in the planting of school-grounds. The soil is usually uncultivated and poor in plant-food. Trees are exposed to unfavourable conditions, including mechanical injury. They do not as a rule receive the same care after planting that privately owned trees receive. When the value of good trees comes to be more fully appreciated by City Councils and School Boards, all of these difficulties will be met and provided for.

Varieties of Trees suitable for Street Planting.

Trees for street planting should be fairly erect in habit so that the crown is broad and dense at a considerable distance from the ground. Trees with low, wide-spreading limbs are undesirable, as they obstruct the view too much. For the same reason coniferous trees are undesirable, and as the forests of British Columbia are mostly coniferous the number of native deciduous trees is quite small. The broad-leaved maple is almost the only one that is suitable, and it is not as good as some other maples which might be grown in nurseries. The following varieties may be mentioned as suitable for street planting and also for use in school-grounds:—

WHITE OR AMERICAN ELM (*Ulmus americana*).

Especially good for planting on wide streets and along the front or street sides of school-grounds. Its high-arching, graceful form allows for free circulation of air, whilst providing sufficient shade. It grows best in moist, deep soil. During recent years it has suffered in some districts from leaf-eating insects and aphides. When young, however, the tree can easily be protected by spraying.

SUGAR-MAPLE (*Acer saccharum*).

A very popular tree for street planting, as well as for use in school and home grounds. It is of fine, upright form, clean, and easy to transplant. Its use in British Columbia is as yet very limited. It is not adapted to very humid conditions, nor to arid conditions unless with moderate irrigation.

NORWAY MAPLE (*Acer platanoides*).

Is claimed to be one of the best maples for street planting. It resembles the sugar-maple somewhat, but usually forms a more dense head, and should therefore be trimmed up to 8 or 10 feet from the ground.

RED OAK (*Quercus rubra*).

It is one of the best oaks for street planting, as it is of good form and makes fairly rapid growth. As its branches are inclined to be horizontal, it needs to be trimmed well up from the ground.

SCARLET OAK (*Quercus coccinea*).

Resembles the red oak and is an excellent tree for street planting, or as a specimen tree in school-grounds.

WHITE OAK (*Quercus alba*).

A stately and beautiful tree, but rather slow in growth.

WHITE ASH (*Fraxinus americana*).

Does best in low or heavy soil, makes rapid growth, has excellent foliage, and is remarkably free from pests.

BLACK WALNUT (*Juglans nigra*).

One of the finest of street trees, takes good form, and has attractive foliage. It grows best in rather heavy soil.

Horse-chestnut (*Æsculus hippocastanum*).

Makes good growth under ordinary conditions and has fine effect as a street tree; cannot stand severe winters; is very beautiful in the spring.

Sycamore or Plane-tree (*Platanus occidentalis*).

Is a very successful tree for planting on city streets, as it withstands the bad effects of smoke and dust very well. It has excellent form and foliage. On rich bottom land it grows to a large size, and is therefore best suited to wide streets.

Tulip-tree (*Liriodendron tulipifera*).

Is also a large-growing tree, suitable for wide avenues. It has excellent foliage and good form, but requires extra care in transplanting.

Yellow Locust (*Robinia pseudacacia*).

A tree of rare beauty of foliage and good for shade; grows to a large size in good soil, but will do fairly well even in poor soil and in dry situations; sometimes throws out suckers from the roots. It seems to do well in most parts of the Province where the winters are not too severe.

Catalpa (*Catalpa speciosa*).

Pale green, large, heart-shaped leaves; has very attractive blossoms in the spring; not hardy in severe climate.

Poplar.

Some species of poplar are valuable for dry districts and can be used where other trees fail. They make very rapid growth, and may therefore be used as "fillers," to be cut out when the permanent trees have made considerable growth. The best varieties are the cottonwood (*Populus trichocarpa*), the Balm of Gilead (*Populus balsamifera*), and the Lombardy (*Populus nigra italica*).

Willow.

The willows, like the poplars, make very rapid growth, and grow fairly well under adverse conditions. They are not to be recommended for permanent planting unless in situations where better trees will not grow. Like the poplars, they may be propagated from cuttings. The best varieties are the royal willow (*Salix regalis*), the shining willow (*Salix lucida*), and the golden willow (*Salix vittelina aurea*). The white willow (*Salix alba*) is used principally along the margins of ponds and streams.

The Manitoba maple or box-elder (*Acer negundo*), on account of its rapid growth, may be used to advantage as a "filler." There are various horticultural varieties of it which are ornamental, but these are not usually as hardy as the ordinary variety. It is not a good street tree.

Two species native to British Columbia should be used in all school-grounds where they can be grown. These are the mountain-ash (*Pyrus aucuparia*) and the flowering dogwood (*Cornus Nuttallii*), the former being found in various parts of the Province and the latter chiefly in the Coast districts. They can be transplanted readily if moved when young. These trees, whilst highly ornamental, are not suited to ordinary street planting, as they are rather small for this purpose.

Along the southern coast of British Columbia the arbutus (*Arbutus Menziesii*) is a tree of striking appearance. It has smooth, reddish-tinted bark, and its evergreen leaves are a delicate shade of green. It is very difficult to transplant, however, and therefore is not much used.

There are other species of trees native to British Columbia which should be represented in all school-grounds where they will grow, and where there is available space, such as the alders, willows, poplars, birch, oak, cherry, wild crab-apple, and the cascara-tree. (*See* also list of native species on page 17.)

There are other good trees of small size that may be used in school and home grounds, such as the hawthorn (*Cratægus species*), Japanese maple (*Acer polymorphum var.*), Schwedler's maple, cut-leaved weeping birch (*Betula alba laciniata pendula*), the mulberry (*Morus rubra*), the double-flowering crab-apple (*Pyrus malus var. Parkmanii*), the flowering cherry, the Kentucky coffee-tree (*Gymnocladus canadensis*), and ginkgo or maidenhair-tree (*Ginkgo Biloba*), purple beech (*Fagus sylvatica pur.*), laburnum (*Cytisus laburnum*), magnolias, etc. These more highly ornamental trees might be classed as lawn trees, and are best grown as specimen trees in school or home grounds.

The best evergreens for school-ground planting are the spruces, the red cedar, the white and Austrian pine, and *Arbor vitæ*. There are many nursery varieties of these, some of which are very attractive and, unfortunately, very expensive. As already mentioned, evergreens are not suitable for street planting. When small they may look quite attractive, but when large would obstruct the view on streets too much. They are best used in school-grounds for rear-line planting, for wind-breaks, or for massed grouping in corners, or as screens. The more ornamental varieties are used mostly in connection with formal planting. There is no part of the Province where evergreens of some kind cannot be found. These include pines, spruces, fir, cedar, cypress, larch, and hemlock. Specimens for planting should be taken from open or cut-over districts, as they are more symmetrical in form and will endure exposure better. It is important to have specimens about 30 inches high, with good branches near the ground, and under no circumstances should they be limbed up from the ground.

Ornamental Shrubs and Vines—Propagation.

It is possible to grow some of these from seeds or cuttings, and every school should take an interest in this work of plant propagation. Especially where school-gardens are operated, a nursery plot for the propagation of trees, shrubs, vines, and herbaceous perennial flowers might be established. A cold-frame is a great convenience in starting seeds, and can easily be made by school-boys. It is like a hotbed in appearance, but no heating stable manure is used in the bottom as in making a hotbed. The frame, which is usually made of lumber 1½ inches thick, is 12 to 16 inches high at the front, and 6 or 8 inches higher than that at the back. It is covered with glass sash (old windows may be made to serve the purpose), the low side of the frame being towards the south. It can be made any length, according to the requirements and glass available. A

great many seedlings can be started in a frame 3 x 6 feet. The frame should be banked around the outside with earth, and, of course, should have good, rich loam inside in which to grow the seeds. Heat is derived from the sun's rays. Shading from strong sunlight is desirable until the seedlings are well started. Good ventilation during the day and some protection on cold nights are necessary. An old rug or mat thrown over the glass at night is sufficient when the nights are cold—i.e., near to the freezing-point. Cheese-cloth frames to use instead of the glass are often very valuable, especially in warm weather. They allow for ventilation and, at the same time, provide partial shade.

It is especially urged upon the teachers that they become familiar with all of the native species of trees, shrubs, and vines in those districts in which they teach, and that they interest the pupils in propagating them from seeds or cuttings, as already suggested. It is safe to say that there are growing wild in British Columbia many shrubs and vines as well as herbaceous plants that are more beautiful and also more suitable for planting in school and home grounds than many of the horticultural varieties purchased from nurserymen at considerable expense. When we consider also the possibilities of improving these already beautiful plants by cultivation and selection, it must be apparent to every teacher that a great opportunity for interesting and profitable nature-study is afforded, not to mention the immense gain in valuable material for ornamental planting. In a few years the school-garden and nursery plot would thus come to be a very popular and interesting institution amongst the people, as well as a great instrument for educational purposes in the hands of the teacher.

List of Shrubs recommended for School and Home Planting.

Only a very limited number of varieties are included in the following list, those that have proved to be most suitable and successful. There are, doubtless, many others equally good, and it is hoped that teachers and others will make note of such trees and ornamental shrubs and vines, both native and imported, as are particularly successful in the various parts of the Province where they happen to be living. The compilation of such information would simply be invaluable in British Columbia at the present time, and contributions along this line forwarded to the *Director of Elementary Agricultural Education, Victoria,* will be greatly appreciated, and will be recorded.

Many nurserymen are now recognizing the desirability of propagating the most attractive native trees and shrubs for sale. It is therefore sometimes much easier to obtain native varieties from nurserymen than to find specimens in the woods suitable for transplanting. Moreover, nursery-grown trees and shrubs are usually of better form than those taken from the woods, and also much hardier. Having been grown in full sunlight, they are able to endure open exposure in school-grounds, and, as they have usually been transplanted two or three times while in the nursery, their root system is much better than is usually the case in specimens taken directly from the woods. The following are the best nursery or horticultural varieties:— .

(1.) Deciduous (most hardy marked *).

Azalea.

The so-called Ghent azaleas are deciduous, but have a strong resemblance to the rhododendron. They may be obtained in various shades of pink, rose, and orange-red. They do best in partial shade and moist soil.

* Barberry.

Three varieties are widely grown—*Berberis vulgaris*, *Berberis Thunbergii*, and *Berberis purpurea*. *Berberis vulgaris* grows from 4 to 6 feet; the purple variety is very attractive on account of its deep purple-coloured leaves. The Japanese barberry (*Berberis Thunbergii*) is low, 3 to 4 feet, and very valuable for untrimmed hedges. All varieties are attractive by winter as well as by summer, on account of their bright-red fruit in dense clusters.

* Siberian Pea-tree (*Caragana frutescens*).

Ten to fifteen feet, and of upright habit; yellow pea-like blossoms in spring. *Caragana frutescens* is not so tall, and is more shrub-like in habit.

* Red Dogwood (*Cornus sanguinea*).

A large shrub, with red branches; makes good contrast with other shrubs. European osier (*Cornus alba*) is similar, and one variety, *Cornus sibirica*, has variegated leaves. *Cornus florida* is more tree-like, resembling the flowering dogwood (*Cornus Nuttallii*) of British Columbia.

Hazel or Filbert (*Corylus avellana*).

The variety *atropurpurea* is especially good, is hardy and easy to grow; height 4 to 6 feet, and makes good contrast with lighter-coloured varieties.

Japanese Quince (*Cydonia japonica*).

A very attractive early-flowering shrub, 4 to 5 feet; flowers pink to red; valuable for groups or for borders.

Deutzia.

Very attractive shrubs suitable for mild climate; height 3 to 6 feet, with pink or white flowers; *Deutzia gracilis* being more dwarf and having white flowers, while *Deutzia crenata* is larger, has pink blossoms, and is more hardy.

Weigela.

Several varieties in many colours, from 4 to 6 feet high. *Diervilla candida* and *Diervilla rosea variegata* are perfectly hardy varieties and very attractive when in bloom.

Golden Bell (*Forsythia viridissima*).

Six to ten feet; has a profusion of bright, yellow flowers early in spring. It is satisfactory in all but the coldest districts.

Althea or Rose of Sharon (*Hibiscus syriacus*).

One of the very best late-blooming shrubs, 8 to 10 feet; blossoms of various colours; a good lawn shrub, but not hardy enough for severe climates.

* Hydrangea.

The variety *paniculata grandiflora* is one of the best and perfectly hardy, 4 to 8 feet high; blooms in August and September, and has large showy panicles of white or cream to pink flowers; needs to be cut back almost annually.

* Tartarian Honeysuckle (*Lonicera tartarica*).

A tall-growing shrub with a wealth of pink flowers in late spring. There are several good varieties.

* Mock-orange (*Philadelphus coronarius*).

Six to twelve feet; has fragrant blossoms resembling those of the orange-tree. There are several other species.

Roses.

These popular flowering shrubs are so very numerous and so well known that they need not be described. They belong in cultivated gardens rather than in lawns; wide cultivated borders suitable for dwarf roses. They have very little pictorial effect, but are grown or should be grown chiefly for their wonderful flowers. When grown in beds not more than one or two varieties should be placed in the same bed, the mass effect being much better than mixtures of forms and colours. In choosing roses for lawn planting, therefore, choose those with the best foliage, as the blooms are good in any case. Singles are usually best for lawn purposes.

* Spiræa.

Of all the spiræas, *Spiræa Van Houttei* is the best for most purposes. It grows from 3 to 6 feet high, and has a wealth of white flowers in spring. It is excellent for lawn and foundation planting. *Spiræa arguta* and *Spiræa Thunbergii* are perfectly hardy and good for similar lines of planting.

* Lilac.

The common lilac (*Syringa vulgaris*) is well known and popular. The Persian lilac (*Syringa persica*) and Japanese lilac (*Syringa japonica*) are found in different shades from white to dark purple, and bloom a little later than the common lilac. The Japanese variety grows somewhat taller than the rest.

* Elders.

At least three varieties are native to British Columbia. There are several horticultural varieties. Usually from 6 to 10 feet high and attractive both in flower and in fruit.

* Snowball (*Viburnum opulus*).

Six to ten feet, well known and popular as a lawn shrub. The Japanese variety (*Viburnum plicatum*) is perhaps more ornamental than the common snowball. The latter is sometimes called the cranberry shrub.

* Purple Fringe or Smoke-tree (*Rhus cotinus*).

Six to twelve feet; a striking and beautiful tall shrub, its inflorescence resembling the shades seen in smoke.

(2.) Evergreens.

The evergreen shrubs include the conifers—cedars, spruces, etc.—as well as the broad-leaved evergreens, such as the laurels and hollies. Some of the coniferous trees that do not grow very fast are treated as shrubs and are kept cut back, but in any naturalistic scheme of planting trimming or shearing would be unthinkable. The following are good horticultural varieties:—

Cypress.

There are several dwarf horticultural varieties that are very attractive. They have flat, appressed leaves, similar to the cedar, which they resemble. *Cupressus Lawsoniana* is to be had in several varieties, each having its own peculiar characteristics as to colour, form, and texture.

Juniper.

There is also a wide range of horticultural varieties of juniper available. The Irish juniper (*Juniperus communis var. hibernica*) has an erect, conical form, with very dense green foliage. The golden juniper (*Juniperus var. aurea*) has bright, golden foliage and low-spreading growth. The red cedar (*Juniperus virginiana*) is a good ornamental shrub or small tree and grows wild in Eastern Canada. One variety of it, *Juniperus var. elegantissima*, has golden bronze foliage. The variety *glauca* has silvery foliage and is very handsome.

Retinospora.

Beautiful evergreens native in Japan, with soft feathery foliage in various shades. *Retinospora pisifera aurea* has foliage of a rich golden yellow; *Retinospora plumosa aurea* is more tree-like and vigorous shrub with golden-coloured foliage; *Retinospora squarosa* has soft, steel-coloured foliage.

Yew.

The Canadian yew (*Taxus canadensis*) is of low-spreading habit; leaves very dark green on the upper side and light green beneath. *Taxus hibernica aurea* and *Taxus cuspidata* (the Japanese yew) are very attractive and hardy.

Arbor vitæ, or so-called cedar, can now be supplied by nurserymen in many varieties. The common white cedar is *Thuja occidentalis*, which grows to a very large size, but there are horticultural varieties that are low and suitable for planting in lawns and in formal gardens. The variety *compacta* is quite dwarf; *globosa* forms a dense round shrub; and *pyramidalis*, upright and compact in habit. Some of them are used in clumps or as specimen shrubs in suitable locations. They are fairly easy to transplant and grow best in fairly moist soil.

The following broad-leaved evergreens can be recommended for districts where the climate is not too severe:—

Boxwood (*Buxus sempervirens*).

Is most useful for low-trimmed hedges or edgings. It succeeds best in moist soil, where the sunlight is not too intense. Some varieties are very dwarf.

MOUNTAIN-LAUREL (*Kalmia latifolia*).

Can be highly recommended for planting in school or home grounds, where a luxuriant, rounded, bushy shrub is desired. It does best in moist, loamy, or peaty soil and grows from 6 to 10 feet high. It has large and attractive pink blossoms.

RHODODENDRON.

These beautiful evergreens are particularly suited to the Coast districts of British Columbia and in for some distance inland, especially in the southern part. They need the same kind of soil conditions as the laurels and can be used effectively in groups with them. There are many horticultural varieties, with colours of various shades, from white to crimson and purple. Most of these garden forms are derived from *Rhododendron catawbiense*, which is native in the Appalachian Mountains. *Rhododendron maximum* ("the great laurel") also grows wild in the North-eastern and Central States, and is much used for large mass effects in large grounds. The best white-flowered rhododendron is probably *Rhododendron Cunninghamii*, which is fairly hardy. Other good ones are *Rhododendron everstianum* and *Rhododendron roseum elegans*.

HOLLY.

The hollies are not hardy in the colder parts of the Province, but thrive well along the Coast. The English holly (*Ilex aquifolium*) grows to be a large and imposing shrub, valued for its dense green leaves and red berries. The American holly (*Ilex opaca*) is fairly hardy and a vigorous-growing species. The Japanese holly (*Ilex crenata*) has rich, green foliage and black berries, and is also fairly hardy.

Azaleas can be used also under moderate winter conditions. They do best in partial shade and moist, woody soil. *Azalea mollis* is a Japanese variety that is highly recommended.

(3.) CLIMBERS.

The use of climbing plants for decorative purposes is becoming more and more general. They are admired both for their foliage and for their flowers. The fact that they are climbing plants, supporting themselves at very short intervals, either by tendrils, adhesive disks, or by twining, makes it possible for them to bear a very much larger load of leaves and flowers than if they had to stand out free in the wind, as trees do. Many climbing plants are not only ornamental in themselves, but also lend a particular charm to other objects with which they are associated. Beautiful buildings are made more beautiful by being clad in the luxuriant and changing foliage of such a magnificent creeper as the Boston ivy. Old buildings, dilapidated fences, and barren rockeries may become objects of fascinating beauty when decorated with fine foliage and gay flowers. Vines have a softening and enriching effect on objects that are harsh or artificial in appearance. They give relief to monotonous lines and surfaces. This makes them very desirable in our school-grounds and about our schools and other public buildings. They form an excellent background for the planting of flowering shrubs and herbaceous plants, and they are invaluable for screening purposes.

There are two general kinds of climbing plants—woody vines and herbaceous vines; the former behaving as trees or shrubs, forming buds in the axils of leaves and producing branches yearly from them, and the latter dying back to the ground each autumn and starting up in the spring from buds which form on a subterranean crown or stem.

(a.) Woody Climbers.

The following woody climbers are amongst the best for school or home purposes:—

VIRGINIA CREEPER OR V ODBINE (*Ampelopsis quinquefolia*).

Is the best woody vine for cold climates. The self-fastening variety is best to use on brick or stone walls. Its tendrils end in adhesive disks which cling tenaciously to the wall without other support. The ordinary variety is as good in every other particular, and gives excellent results where some support is provided. It is readily propagated by cuttings and should have good earth for the promoting of vigorous growth.

BOSTON IVY (*Ampelopsis Veitchii*).

A native of Japan, and one of the finest creepers. It is not quite so hardy as the Virginia creeper, but may be used in all but the coldest parts of the Province. It gains in hardiness with age. In districts having severe winters it is likely to succeed best on north or east walls, as it remains dormant in that exposure for a few weeks later in the spring, thus escaping the bad effects of thawing and freezing. This species, as well as the former, assumes the most gorgeous colours in the autumn. It can be propagated from seeds and also from cuttings.

DUTCHMAN'S PIPE (*Aristoloc. a Sipho*).

Is a most attractive vine, especially for verandah posts and porches. It has enormous heart-shaped leaves.

EUROPEAN IVY (*Hedera helix*).

An excellent vine in the milder parts of the Province; very useful in covering old walls or bare rock-slopes, stumps, posts, etc. It can be grown from cuttings.

HONEYSUCKLE.

There are several varieties. The Japanese honeysuckle (*Lonicera Japonica Halliana*) is hardy and succeeds on fairly dry soil; has yellow flowers changing to ·te; requires netting or other support.

ROSES.

There are numerous varieties of climbing roses. They must be supported on a trellis or on wire netting and require a good deal of attention every year in trimming, spraying, etc. The Crimson Rambler and Dorothy Perkins are very popular varieties. In cold districts they can be grown successfully only when taken down and covered for the winter.

(b.) Herbaceous Climbers.

CLEMATIS.

This most popular climber is now to be had in numerous varieties. *Clematis paniculata* is a valuable white, small-flowered variety; *Clematis Jackmanii* is the best large-flowered purple; *Clematis Henryii* is pure white with large flowers. Their method of climbing by a winding movement of the leaf-stem is interesting, peculiarly economical, and efficient.

(4.) NATIVE SHRUBS.

Emphasis has already been placed on the utilizing of our own native trees and shrubs in connection with the planting and beautifying of school-grounds. Just at the present time it is more difficult to get suitable stock of native varieties for ornamental planting than to get horticultural varieties from nurseries. If, however, we can finally succeed in getting an abundance of good native varieties for planting in school and home grounds, as well as in parks and public playgrounds, it will be more satisfactory than to go on planting varieties that have been introduced by nurserymen from other countries. The teachers of the Province might do much in making more popular our own native species by, first of all, bringing the pupils into closer acquaintanceship with them; and, secondly, by propagating the best varieties in school-garden or nursery plots. If we succeed in this, our schools throughout the Province will soon take on a different appearance and will be given a most admirable tone and a more national character.

Through the courtesy of Mr. John Davidson, Provincial Botanist, himself an ardent student of our native species and a strong advocate of a more wide use of our flora for educational as well as decorative uses, we are able to give the following list of native British Columbia shrubs and vines, with descriptions prepared by him. Such of these as can be obtained might well be more widely used in planting our school and public grounds.

Deciduous.

Ericaceous Shrubs.

Rhododendron albiflorum (White Rhododendron).

Is a beautiful shrub with whitish bark and thin leaves. The flowers, which are borne in axillary clusters, vary from creamy white to pure white. Height 4 to 6 feet, well adapted for use in partially shaded situations and in soil rich in humus. Found on mountain-sides in the vicinity of Vancouver.

Cladothamnus pyrolaflorus (Bronze-flowered Cladothamnus).

Resembles the rhododendron in habit, but with branches more erect. The flowers are extremely interesting, being of a reddish-bronze or salmon colour. They are about an inch in diameter and are formed before the leaves have reached their full size. They thrive in situations similar to the former.

Menziesia ferruginea (False Azalea).

This plant has been mistaken by many horticulturists as a true azalea. Its foliage closely resembles *Azalea mollis*. The flowers, which are small

and urceolate, arise in axillary clusters near the tips of the branches. They are comparatively small plants, 3 to 4 feet high, although at times they reach in shade a height of over 6 feet.

Most ericaceous shrubs thrive in peaty soil, which should therefore be provided where they are planted.

Rosaceous Shrubs.

Amelanchier alnifolia and *florida* (June-berry or Saskatoon).

Is one of our most showy shrubs, which may be grown into a small tree. It flowers early and when planted in groups presents a magnificent display of drooping racemes of showy white flowers (*see* Fig. 29, First Report, Botanical Office). It thrives best in loam, but is sometimes found on hot, sandy soil. The foliage is of a beautiful pale green in spring, turning to a darker blue-green in the fall, with clusters of edible berries, which are used as food by the Indians.

Physocarpus opulifolius (Ninebark, formerly called *Neillia opulifolia*).

Is a showy and useful shrub for decorative effect. It is beautiful when planted on the top of low embankments, so that the arched branches present a bank of white flowers in early summer, and with beautiful clusters of curious red bladdery fruits, whence the name *Physocarpus*. The flowers are in creamy-white clusters, forming a ball-like inflorescence when well developed. The foliage, flowers, and fruit are quite ornamental.

Crataegus Douglasii (Douglas' Hawthorn).

Somewhat resembles *Crataegus oxyacantha* in habit, as it may assume either the tree or shrub form. Its beautiful dark-green foliage makes a suitable background for other plants, such as the red-berried elder, with its golden to yellowish-green foliage. It is a good grower and might be used as a hedge or screen in school-grounds.

Nuttallia cerasiformis (Indian Plum; also called Bird-cherry).

Blossoms are white and appear before or with the opening leaves. The fruit is composed of five little drupels, and as a rule, when only one develops, it is rather plum- or peach-like. Old plants may reach a height of 12 to 15 feet in the form of a small spreading tree.

Rosa pisocarpa (Wild Rose).

One of the most showy of our native wild roses, and when grown in a suitable locality is extremely floriferous. The fruits, which are a beautiful glossy crimson, remain for some time after the leaves have fallen, when the shrub is even more attractive than when in bloom, and often presents the appearance of a bank of flame.

Rubus spectabilis (Salmon-berry).

Well known in the horticultural world and invaluable for planting in masses and for beautifying unsightly corners. It has been almost completely destroyed around many cities as a result of wholesale clearing operations, but is widely distributed throughout the western part of the Province.

Rubus leucodermis (Black Raspberry).

A highly ornamental plant, w[illegible] its leaves green above and white below, and with its beautiful clusters of [illegible]ining purplish-black berries. It reaches a height of from 4 to 6 feet and is most effective when planted in clumps. The stems are glaucous-white and prickly. Another related species, *Rubus parviflorus*, is quite attractive in summer, forming banks of pale-green foliage and white flowers. Later, the foliate turns yellowish-green and the fruits scarlet. It cannot be recommended, however, on account of the fact that its branches sometimes present a hideous appearance during winter and spring, due to large swellings caused by gall-flies.

Miscellaneous Shrubs.

Ribes sanguineum (Red-flowering Currant).

Is very abundant in districts west of the Cascades and is easily propagated from cuttings. The flowers vary somewhat in colour in different localities, varying from pale pink to scarlet and deep crimson. It shows to great advantage when massed with *Amelanchier*, which flowers about the same time, and presents a delightful contrast in colour of blossom as well as leaf. A number of these have been treated as standards and the result is very effective in spring.

Ribes Lobbii (Red-flowered Gooseberry).

Not so well known as the former, but common in the vicinity of Goldstream and other parts of Vancouver Island. It has large prickers, which may, of course, be distinguished from spines by their origin. It may be valuable for hedge planting and is valuable for its flowers as well as fruits.

Philadelphus Lewisii (Syringa or Mock-orange).

This plant is common in some parts of British Columbia and should certainly be freely used for beautification. It is 3 to 8 feet high and has conspicuous white flowers. (*See* reference in list of nursery varieties.)

Rhus glabra (Sumach).

Usually grows as a shrub, 3 to 5 feet in height, but may be grown on a standard like a small tree. It is a magnificent shrub, with beautiful coppery-green leaves in spring, producing showy pyramids of small flowers; afterwards followed by a large cluster of red berries and autumnal tints, which are hard to beat for a display of fire-reds, browns, and greens.

Cornus Nuttallii (Nuttall's Dogwood, and also commonly called Flowering Dogwood).

It is often mistaken for *Cornus florida*. Our native dogwood is said to be the best of all the dogwoods, but not being so hardy as *Cornus florida* is not so much cultivated by horticulturists. Our species, however, is hardy in most parts of British Columbia, being found in the Interior and on the Coast. From an ornamental standpoint it is of the greatest value, and it is also most interesting and instructive from a botanical standpoint. It may be grown either as a shrub, sending up large numbers of suckers

and producing hundreds of flowers each spring, or it may be grown as a tree from 30 to 40 feet high, and somewhat resembling the wild cherry. No doubt many have had an opportunity of admiring its gorgeous autumnal colours during the fall. (Reference has already been made to this species in another part of this circular.)

Elæagnus argentea (Wolf Willow or Silverberry).

Is a beautiful shrub with white, silvery foliage. It is transplanted with difficulty during the summer, but plants obtained in winter or spring from the Dry Belt grow perfectly well at the Coast. They produce clusters of small, yellow flowers, afterwards followed by silvery berries, giving it a decidedly ornamental appearance.

Shepherdia canadensis (known to the Indians as the Sopolallie, which means Soapberry).

It is common in the Interior and in various parts of the Coast, especially in some places near Victoria. It has a peculiar brownish foliage when young, due to the presence of small scale-like hairs on the leaves. The little clusters of yellow flowers which appear in spring are followed later on by the yellowish-red berries which ripen in midsummer. This plant is a good one to illustrate the Indians' use of wild plants for food. They make a kind of frothy substance from the berries of this plant, and this is "licked" in much the same way as children begin an ice-cream cone.

Symphoricarpus racemosus (Snowberry).

Is a valuable little shrub which is much used in Britain. It is very common in some localities on the Coast, as well as in the Interior. It grows well in exposed and in shady places, and having slender branches it can withstand the wind fairly well. The little clusters of rose-tinged flowers are quite showy, and the white berries, which remain on the plant long after the leaves have fallen, help to break the monotonous appearance of the grounds during winter.

Fatsia horrida (Devil's-club).

This plant is a denizen of cedar swamps and dense bush, being well known to loggers and others who have had occasion to penetrate dense forests along the Coast. In the deep woods it may be found 10 to 12 feet high, with leaves several feet in diameter. In more open places the plant is not so tall nor the leaves so large. Its stem and leaves are covered with strong bristles or prickles, a thoroughly adequate protection against the attacks of animals. It belongs to the Aralia family and is quite ornamental. It can be successfully transplanted, but on account of its large leaves should never be placed in a situation subject to strong gusts of wind. As its leaves are adapted for rapid transpiration and evaporation of water, the plant should be placed in soil which has a good natural supply of water, or which is sufficiently rich in humus to retain water when supplied to it. The flowers, though not particularly showy, are interesting, and the spike of red fruits in the centre of a cluster of large leaves is quite an attractive sight.

Native Evergreen Shrubs.

Rhododendron californicum (Rhododendron macrophyllum).

Is a species which has been declared to be equal to many of our horticultural varieties. So far as is yet known, it is rare in British Columbia, but common in one locality, from which specimens have been obtained and are now being propagated in the Botanical Garden. As a result of hand-pollination with some of these in the Botanical Garden, a fairly good supply of seeds were obtained, which have been sown. Ripe fruits of this species were obtained from Skagit Valley in 1915, which have also been sown, and now, after a year, some thousands of young plants are coming on. This species should not be confused with *Rhododendron albiflorum*, which is entirely different.

Vaccinium ovatum (Evergreen Huckleberry).

Is also known as a horticultural variety. It resembles the evergreen privet, only in the summer its branches are clad with clusters of small, pink, waxy flowers. In the fall they are replaced by scarlet berries, which occasionally remain until winter. This species can be propagated by cuttings.

Berberis aquifolium (Holly-leaved Barberry).

Well known to horticulturists and native in British Columbia. It has spiny leaves, which protect it from being eaten by quadrupeds. Its flowers are particularly interesting as they afford a good illustration of sensitiveness. When the flowers, fully open, are suddenly touched with a pencil or finger, the stamens suddenly bend towards the centre.

Berberis nervosa.

This is also native, but not so well known, and exhibits the same "sensitiveness" in its flowers. It is a low evergreen shrub with flowers and berries similar to *Berberis aquifolium*, and is suitable for planting in soil-pockets in rock-garden work.

Arctostaphylos tomentosc (Manzanita or Bearberry).

Has greyish-green leaves and smooth cinnamon-brown bark. It produces small clusters of pink, waxy flowers, which are later replaced by red berries. They may also be grown on standards, so that they can be utilized singly.

Pachystima Myrsinites (False Box).

Is a plant that has often been mistaken by horticulturists as a species of box (*Buxus*). It belongs to the Euonymus family and should be valuable for hedge purposes. The flowers in spring are inconspicuous, but when examined closely will be found to be very beautiful. It has small leaves somewhat like those of the box, though usually serrate. It varies in height from 1 or 2 feet to 8 or 10 feet, and is suitable for trimming, as is the ordinary box.

(5.) Native Climbing Plants.

Clematis ligusticifolia.

A species common in many parts of the Dry Belt and well known to horticulturists. It is a magnificent plant when trained on trellis-work or allowed to ramble on a pergola. It has been seen to practically cover a small mountain-maple, its shoots rambling over it in all directions, so much so that the maple itself was obscured under the mass of foliage and small white flowers. The flowers were so prolific that at a distance it looked as if the tree had a coat of snow. This growth was found in what is called a "dry creek" in the Dry Belt. Some plants are staminate and some pistillate. It is desirable, therefore, that specimens of both kinds be grown near together, so that the pistillate flowers may be pollinated and fruit produced, which in itself is very attractive on account of the long, feathery styles.

Clematis Douglasii.

Is a large-flowered species of clematis, with deep purple flowers.

Clematis columbiana.

Another large-flowered one with pale-blue flowers. Several plants of this species have been received from correspondents and are growing in the Botanical Garden. It is found in the Interior, as is also *Clematis Douglasii.*

Lonicera ciliosa (Honeysuckle).

Is our best honeysuckle for beautification purposes. It affords a good example of connate leaves, forming a kind of cup around the stem. The leaves are comparatively large and of a glaucous-green colour.

When to transplant Trees and Shrubs.

The best time to move trees and shrubs depends partly upon climatic conditions and partly upon the species to be transplanted. Broad-leaved trees should be moved only when dormant, or nearly so; that is, either in spring, before the buds open, or in the autumn, after the leaves fall. The leaves of deciduous trees give off water rapidly, and if the root system is suddenly reduced, as is necessarily the case in transplanting, the normal supply of soil-water is cut off, the leaves go on giving off water until they wilt, and the tissues of the tree, which contain a large percentage of water, become dried to such an extent that cellular action ceases and the tree dies.

Severe cold, moreover, is equivalent to drought in its effects upon growing plants, so that in districts where severe freezing takes place during the late autumn and winter, transplanting should be done in early spring. In mild districts, and especially in those districts which have an abundant rainfall late in the autumn, planting may be done with safety as soon as the leaves have dropped, in October or early November. The soil is still fairly warm, while the air is cool, which condition is conducive to root-development.

Evergreens are more difficult to transplant than most of the deciduous trees, and yet with care they can be moved successfully at almost any time

of the year. This is accounted for by the fact that the leaves of evergreens give off less water, or give it off much more slowly, than do those of the broad-leaved deciduous trees.

Precautions to be observed in the Moving of Trees.

Sun and wind are the cause of frequent failures in transplanting, because of their drying effects upon the exposed rootlets and root-hairs. The root-hairs of some species, notably the conifers, quickly collapse on exposure to dry air, so that it is essential to success in transplanting that the following precautions be observed:—

(1.) Preserve as much of the root system of the tree as possible.

(2.) Whilst out of the ground keep the roots protected by covering with damp rugs or litter.

(3.) If there is delay after they arrive at the place for planting until they can be set in, have them heeled in by digging a light trench and covering the root in it.

(4.) If possible, move trees on a damp or cloudy day.

(5.) To ignore the above precautions will mean the planting of "dead" trees.

Root-trimming.

Just before placing the tree in the ground, make an inspection of its exposed roots and remove with a clean, oblique cut all lacerated and broken roots. Have the cut surfaces on the upper side. New rootlets develop at the ends of these cut roots after a healing-over has taken place, and this healing is much more rapid on clean-cut surfaces.

Trimming or cutting back the Top.

The top of any tree may be regarded as the expression of its root system and maintains a balance with it. If the root of a tree is much reduced in transplanting, therefore, it is desirable to reduce the top correspondingly. It is not necessary to remove all branches and cut back the leader, as is sometimes done, unless you wish to re-form the top altogether. This trimming process affords an opportunity to restore a balanced top in young trees where the development has been unsymmetrical and faulty. Top pruning need not be so severe when transplanting is done in the fall as when in the spring, as the root system has made a considerable amount of recovery during the late fall and early spring before the leaves come out.

The Soil and the Opening.

Some trees manage to live and make some growth in very poor soil, but all do much better when planted in good soil. One experienced tree-planter says that the fundamental cause of the failure of most street trees is the lack of proper soil, and remarks in this connection that undue economy in providing good soil is the worst kind of extravagance. The only solution of this question is the transportation of some good soil to use around the tree in place of the poor soil excavated in digging the hole. This means more work and expense, but it is the price of success. It is important that the opening for the tree be large enough to accommodate all the roots with-

out crowding and have room for an abundant supply of good soil, which should be closely packed around the root. For ordinary trees 10 to 12 feet high this opening should not be less than a yard square and 2 feet deep. This will allow of putting some good soil in the bottom before placing the tree. As the top soil is always more fertile than the subsoil, it is best to put it on one side of the hole and the subsoil on the other. The holes should always be prepared before the trees are brought. Always place line trees in the hole in such a position as will give least exposure to crooks or other external imperfections. A notion that some people hold that a tree will not grow well unless it is oriented in its new position exactly as it stood in the woods is nonsense with a tinge of superstition. A much better case could be made out for the opposite—viz., that a tree should be oriented through 90 degrees in transplanting it to a new location.

The Planting.

There are many details to be observed in the planting of a tree or shrub, and many successful tree-planters differ in these details of procedure. Some trees will grow in spite of all these non-essential details, and yet we believe that "trifles make perfection." The Forestry Division of the United States Department of Agriculture, in their circular on Arbor Day planting, have given a well-nigh perfect and remarkably complete formula for tree-planting, and we cannot dispose of this question in a better way than to quote it, as it represents the experience of many nurserymen and tree-planters:—

"Planting is best done by two or three persons. A, who manipulates the tree, is the planter, and is responsible for the results; B and C do the spading, under his direction. A places the tree in a hole to ascertain whether this is the proper size. A board or stick laid across the hole aids in judging the depth. Trees should never be set deeper than they stood before, except in loose, poor soil. More trees are killed by too deep planting than the reverse. If the root system is developed sidewise but not centrally, as is often the case, a hill is raised in the hole to fill out the hollow space in the root system, and the earth of the hill is patted down with the spade.

"When the hole is in proper order, A holds the tree perpendicularly in the middle of the hole, with the side bearing the fullest branches toward the south or south-west, for better protection of the shaft against the sun. B and C spread the roots into a natural position, and then fill in the soil, using the good surface soil first—small handfuls deliberately thrown over the roots in all directions—while A, by a slight shaking and pumping up and down of the stem, aids the earth in settling around the rootlets. A close contact of the soil with the rootlets is the secret of success in planting. Only fine, mellow soil, not too moist and free from stones, will permit such close adjustment to the rootlets, which should also be aided by hand and fingers filling in every crevice. A, while setting the tree, must exercise care to keep it in proper position and perpendicular, until the soil is packed so as to keep the tree in place. Then B and C rapidly fill in the hole, A treading down the soil firmly after a sufficient quantity is filled in, finishing off a little above the general level to allow for settling, and finally placing stones or any mulching around the stem.

"Do not use water while planting unless it is very carefully applied with a 'rose' after the soil is well filled in and packed around the fibrous roots. It is not uncommon to see water poured into the hole while it is being filled up. This practice does harm rather than good, for it washes the fine soil away from close contact with the roots, leaving empty spaces between the roots, or even leaving, as the water dries and the earth hardens, the little rootlets in the midst of hollows like the insides of pipe-stems. In such a case they cannot touch the earth, which gives them nufriment, and they die. More trees are killed by too much water in transplanting than by too little. Water after the transplanting is useful, and should be applied during the hot season, the late afternoon or evening being chosen for its application."

The Care of Trees after Planting.

It is a mistake to assume that everything is done once the tree is planted. Success in the growing of trees depends upon many things, but it will be apparent to all that, especially during the first few years, trees and shrubs need constant attention. They must be protected against injury from wind, animals, and romping boys and girls; they must be saved from defoliation by insects or other kinds of insect injury; they must not be allowed to die of thirst and starvation; they must not be mutilated by careless linemen; and, finally, they must be helped by the judicious use of the pruning-shears to grow each into its best and most beautiful form.

(1.) Protection and Support.

Emphasis has been placed on the importance of having the young trees planted in a perfectly upright position and in line. They can only be kept so on streets or in school-grounds by the use of supports. For street use a straight stake, 2 inches square, driven down close beside the young tree in a perfectly vertical position is all that is necessary as a support. The stem of the tree is bound firmly to the stake, 4 or 5 feet from the ground, a protecting cushion of some sort being placed between the tree-stem and the stake at the point where it is bound. If placed on the south side, it also serves to protect the stem from sun-scald. This support would, of course, be removed after a few years.

When trees are exposed to mechanical injury, such as the biting of horses, rubbing of cattle, or even the "swinging" of boys and girls, some kind of tree-guard is necessary. There are, of course, many kinds of these, some being very elaborate and very expensive if used in large numbers, and others being quite simple and inexpensive. A very inexpensive guard may be made by wrapping wire netting of about 1-inch mesh around the tree and its supporting stake. Strong wooden slats riveted on three pieces of band iron—one near each end and one in the middle—make a serviceable tree-guard. This would require about eight slats, ¾ inch thick and 1½ inches wide. They would be placed an inch apart and would be held in position by the three iron bands. The guards would stand about 6 feet high, but every second slat would be left about 18 to 20 inches longer than the others, and would be pointed for driving into the ground. The band iron used

would be about 1½ inches wide and 3/16 inch in thickness, with holes drilled at regular intervals to take the rivets, with end holes to take a short bolt fitted with a nut. These guards, which could be made in the shop, would be put on by spreading the unjoined ends of the iron bands apart so as to get the guard around the tree in its place, then putting in the three connecting bolts and driving carefully down. When thus made secure the young tree would be tied securely in its guard, no other support being necessary. If these guards are neatly made of dressed lumber and painted green they will not detract from the appearance of the tree, and the paint will also preserve the guards for years.

A simple combination guard and support is made by driving four pieces of dressed scantling, 2 inches square and about 7 feet long, into the ground in such a way that whilst 2 feet apart at the ground-line they will be only 1 foot apart at the top. Strapping-boards about 5 inches wide are nailed around near the ground, at the top, and in the middle. If these are carefully made and painted dark green they are very satisfactory.

(2.) Injury caused by Insects and Fungous Diseases.

It is easier to protect young or small trees from injury by insects than large ones, as such protection most frequently involves spraying. Insect enemies may be grouped roughly into three classes: (1) Biting or chewing insects; (2) sucking-insects; and (3) borers and bark-beetles. It is, of course, impossible to enumerate here even the commonly known species of insects which attack our trees and shrubs, but when once it has been ascertained to which of the three above-mentioned classes the insect belongs remedial measures may be carried out intelligently.

For chewing-insects, those which destroy the leaf-tissues, a poison spray is desirable. There are two poisons in common use, Paris green and arsenate of lead. These are applied either with water or mixed with air-slaked lime or cheap flour. To prevent Paris green from burning the foliage a small quantity of lime is put in the water. The following formula is safe for most kinds of foliage: 4 lb. quicklime; 1 lb. Paris green (or 2 lb. arsenate of lead); 60 gallons water. The lime should be slaked in a little water before adding to the mixture. When used with dry air-slaked lime or flour, the following proportions may be used: 1 lb. Paris green (or 2 lb. arsenate of lead); 40 lb. dry air-slaked lime (or 20 lb. dry cheap flour). White hellebore in powdered form can be used safely on foliage, also pyrethrum, or common insect-powder. Any of these dry powders are best used while the leaves are moist, as it adheres to them much better. When spray mixtures are used, it is important to use a pump with good pressure and a fine nozzle, so that the fine spray will reach all parts of the foliage.

For sucking-insects, those that pierce the epidermis of the leaf and suck out the juices, it is necessary to use a spray mixture that kills them by external contact, as it is obviously impossible to poison their food as in the case of leaf-eating insects. Soap solutions are fairly good, especially whale-oil soap, 1 lb. to 4 gallons of water. Kerosene emulsion is one of the best spray mixtures for sucking-insects, such as aphides or plant-lice and leaf-

hoppers. It is made as follows: ½ lb. of common laundry-soap is dissolved in 1 gallon of hot water. While still hot 2 gallons of kerosene is added, and the mixture churned for five or ten minutes until a creamy liquid results. If properly made, this emulsion will not separate out and may be kept as a stock solution. If used on plants in leaf, dilute the emulsion with ten to twelve times the volume of cold water. If used on dormant plants, to kill insects on the bark only, five or six times the volume of cold water is used.

Some sucking-insects attach themselves to the bark of twigs or stems and secrete a protective, scale-like covering. These are the so-called "scale-insects." The San Jose is very common in orchards, as is also the oyster-shell scale or bark-louse. When the young insects swarm out from beneath the shell covering of the parent insect they are easily killed by painting the trunk and limbs with linseed-oil or spraying with soap solution or kerosene emulsion. The lime and sulphur spray is also used and is more powerful, but somewhat harder to prepare. It is being sold, however, already prepared for dilution.

Tree-borers are harder to discover, and, fortunately, are not quite so common as the other insects referred to. A careful examination of the ground at the base of the tree may reveal small quantities of borings of bark and wood, which will reveal the whereabouts of the borer. Once located, the only remedy is to dig them out with a knife and paint over the wounds. Scraping the bark makes it easier to locate the borings exuded upon the surface. In some cases the placing of tar bands around the tree prevents the wingless female insect from crawling up the tree to deposit eggs. This is true of the canker-worms.

Fungous diseases are caused by low forms of plant-life which are parasitical upon other plants which are called "hosts." These low forms, which are known as "fungi," have branching root-like parts (mycelia) that penetrate or "digest" their way into the tissues of leaf or stem, thereby weakening it, frequently causing deformity in those parts affected, and resulting in loss of function of the parts of the host-plant which suffers the attack. Familiar examples of these fungous plants are the mildew on the leaves of lilacs and roses, the rusts and blight that attack the leaves of fruit and shade trees, the smut of grain, etc. Fungi are propagated by spores, which are such minute particles that they are carried long distances by the wind. These spores germinate and grow rapidly in warm, moist weather.

The only direct method of preventing or arresting these fungous diseases is spraying with solutions which destroy the germinating spores or external parts of the fungous plants. It is, of course, impossible to reach the mycelial threads which have penetrated into the tissues of the host-plant. Copper sulphate or blue vitriol has long been known as a powerful fungicide. Unfortunately, it is also injurious to the leaves of plants unless used in very dilute solution. One part blue vitriol to 1,500 to 2,000 parts water is as strong as can be used; 4 oz. of blue vitriol would require 50 gallons of water. By combining unslaked lime with the copper-sulphate solution, however, it can be used much more effectively. This mixture is known as Bordeaux mixture and is made as follows (if 50 gallons of the

mixture were required the following would represent the formula): 4 lb. copper sulphate; 4 lb. unslaked lime; 50 gallons water (rain-water preferred).

In preparing the mixture, proceed as follows: Slake the lime first by adding a little water, and then dilute by using half the whole amount of water to be used (in this case 25 gallons). Dissolve the copper sulphate in a wooden tub or pail by suspending it in a thin sack in the water so that the copper sulphate is just submerged. Dilute this, using the other 25 gallons, and then mix the two solutions together and stir or churn them vigorously. The result is a mixture of a robin's egg blue colour, and giving an alkaline reaction. If by chance the mixture should give an acid reaction, an insufficient amount of the lime was used. In such a case slake some more lime, dilute as before, and add to the mixture until it gives an alkaline reaction. Strain through a cloth before using. This mixture should be put on with a pressure spray-pump which throws a fine mist-like spray. If a shower of rain should come on after spraying, it would be necessary to repeat the treatment. This mixture is also used on potatoes as a preventive against blight. It is first applied when the tops are 10 or 12 inches high and is repeated every two weeks.

The chief objection to the Bordeaux mixture is the fact that it besmears the foliage for a time. The trees or shrubs could, however, be washed off with the spray-pump, using clear water, after a week or ten days. It is better to do this in any case, as the presence of a heavy coating of the mixture on the leaves somewhat impairs their function.

Trees and shrubs that are in a vigorous growing condition may resist the attacks of fungous diseases, whilst the same species in a weak condition would be sure to be affected. This is an additional reason for giving attention to the cultivation and fertilizing of trees and shrubs after planting.

(3.) Watering, Cultivating, and Fertilizing.

All trees, but particularly the broad-leaved trees, require a good deal of water. In most parts of British Columbia the summers are dry and warm. In the dry Interior some provision for irrigation is necessary if anything but dry-land vegetation is to be grown. The food which plants take from the soil must be in very dilute solution, so that if there is not sufficient water supplied to the tree it suffers for food as well as for drink.

When it is necessary, then, to use artificial watering, use plenty of it, but not too frequently. A good deal of the soil-water can be conserved for the tree by keeping the soil cultivated around it. This cultivation should be renewed the day following the application of water. Trees are not different from other plants, in that they respond to fertilizing. If, as is so frequently the case on streets and in school-grounds, the soil is coarse in texture and lacking in soluble plant-food, a heavy coating of well-rotted stable manure is spaded in once a year, it will make a great difference in the rate of growth. There are occasionally certain districts met with where the soil is naturally fertile and the rainfall abundant during the growing season, and in such districts no artificial watering or fertilizing would be needed, as

the trees may make too rapid a growth and become top-heavy or grow out of shape, and suffer from splitting of stems in heavy storms.

(4.) Pruning and Trimming.

In any scheme of natural planting the trimming of trees and shrubs would not be allowed, but in connection with trees grown on streets and in school or public grounds some pruning is sometimes necessary. Trees that are faulty in shape may be helped by judicious pruning. Balance may be restored to unbalanced crowns by removing some branches and cutting back others. A certain amount of pruning, even in old and failing trees, often induces new growth and invigorates them.

In the case of young seedling trees it is necessary to prune off the lower branches, some every year and not too many in any one year, until the first branches to form the permanent crown have been reached. As a rule, the lowest branches on deciduous trees in school or home grounds should not be less than 8 feet from the ground, and on streets 10 or 12 feet. Less than this will be all right if the branches have an upward slant. Once the young tree is properly headed, it should be allowed to take its own natural mode of growth. It may here be observed that a young tree is not well headed if its trunk breaks into two equal branches, thus forming a dangerous fork, which later on is apt to split and spoil the tree altogether. This can be safeguarded only by the careful trimming of the tree from the start.

If the branches are making excessive growth, they may be cut back in late summer and watering stopped. Cutting back the leaders induces branching and tends to thicken the crown or top. The practice of "dehorning" large trees—cutting all their branches off near the trunk—is to be condemned. The stubs die back to the first growing branch and must eventually decay. The tree tries to recover from this tremendous shock and undue unbalancing of its system, and an enormous crop of water-sprouts or fast-growing shoots are thrown out from the cut ends, with the result that excessive crowding begins and an ill-formed crown of brush-like branches is produced. It is preferable to take out a certain number of branches entirely, thus opening up the top and giving a chance for the remaining branches to develop laterally. Coniferous trees should not be trimmed at all.

The mutilation of street trees by linemen in the employ of electric and telephone companies is in many cases nothing less than an outrage. In some cities penalties are imposed upon the companies found guilty of this offence. Streets and street trees are public property. Telephone poles and lines are usually the property of private individuals or companies, who have formed the habit of using the streets for their poles and wires. The time is coming when this destruction of the people's property by private corporations will not be tolerated. Each city or municipality should authorize a competent man to act as tree warden, who would have authority to control all planting and direct all street operations which in any way had to do with the trees.

Trees are usually trimmed in the fall or early spring. Maples, of course, must be pruned in the fall to prevent loss of sap. There are some reasons why it might be better to prune all trees in the fall. Healing of

the wounds and bud-development might continue for a time, as the ground is still warm in September or October, when fall pruning would be done in most parts of British Columbia. Thus the wounds would heal before severe frost, and meanwhile the buds on remaining branches would be strengthened more than if the pruning had been deferred until spring. Great care should be taken to avoid peeling of the trunk when heavy limbs are being removed. This is avoided by first making an upward cut with the saw in the under side of the limb and close to the trunk, and then sawing down from the upper side of the branch to meet the under cut. All large surfaces freshly cut should be painted.

Flowering shrubs are usually pruned soon after the flowering season, as early spring or late fall pruning would, of necessity, remove large numbers of flower-buds. In the case of roses and other shrubs that bear the flowers on the new wood each year, early spring pruning is best. Such shrubs can also be pruned back heavily so as to produce more vigorous growth of flower-bearing wood.

Trees and shrubs transplanted in the fall should have the earth somewhat heaped up around them so as to prevent water from standing around them during the early winter or spring. If the earth is raised up close to the stem of the tree it will drain off quickly, and, being fairly dry, will act as a protective mulch in freezing weather. In late spring this little cone of earth would be raked down again to the level of the ground.

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